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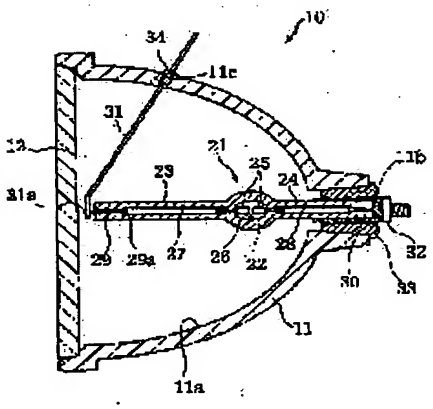
(54) DISCHARGE LAMP AND LAMP APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a high pressure vapor discharge lamp and its apparatus being able to prevent wire disconnection due to oxidization, etc., of the welded part or the like of wiring members, to attain a longer life of the lamp and to reduce the defective rate while the lamp power is increased and the reflector is down-sized.
SOLUTION: The lamp comprises a luminescent material including light-emission tube where a pair of electrodes are opposingly arranged inside, a discharge lamp equipped with a pair of the sealing portions extended from the light-emission tube, a reflector reflecting the light emitted by the discharge lamp, a transparent member covering the reflector opening and accommodating the discharge lamp in the space with the reflector, excessive temperature rise restraining means to restrain the temperature rise at the welded points of the wiring members electrically connected to the discharge lamp electrodes.



10 ランプ装置
11 反射鏡
12 前面ガラス
22 発光管
23、24 封止部
25 放電電極
27、28 金属箔
29、30 金属ロッド
29a、30a、31a 溶接部
31 リード線

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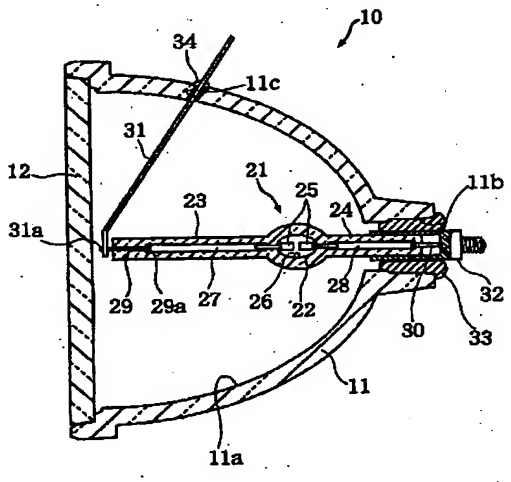
(54)【発明の名称】　放電ランプおよびランプ装置

(57)【要約】
【課題】ランプ電力を増大させたり反射鏡を小型化したりしても、配線部材の溶接部分などの酸化等による断線を防止でき、ランプの長寿命化や不良率の低下を図ることができる高圧蒸気放電ランプおよびランプ装置を提供する。
【解決手段】発光物質が封入される管内に一対の電極が対向して配置された発光管と、発光管から延在する一対の封止部とを備えた放電ランプと、放電ランプの発した光を反射する反射鏡と、反射鏡の開口部を覆い、反射鏡との間の空間に放電ランプを収容する透明部材と、放電ランプの電極に電気的に接続された配線部材の溶接箇所の温度上昇を抑制する過昇温抑制手段とを備える。



10　ランプ装置
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23、24　封止部
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27、28　金属箔
29、30　金属ロッド
29a、30a、31a　溶接部
31　リード線

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【特許請求の範囲】

【請求項１】　発光物質が封入される管内に一対の電極が対向して配置された発光管および前記発光管から延在する一対の封止部を備えた放電ランプと、
前記放電ランプの発した光を反射する反射鏡と、
前記反射鏡の開口部を覆い、前記反射鏡との間の空間に前記放電ランプを収容する透明部材と、
前記放電ランプの電極に電気的に接続された配線部材の溶接箇所の温度上昇を抑制する過昇温抑制手段とを具備するランプ装置。

【請求項２】　前記放電ランプの封止部は、箔封止構造である請求項１記載のランプ装置。

【請求項３】　前記放電ランプを収容する前記反射鏡および前記透明部材の内部が気密に密閉されている請求項１記載のランプ装置。

【請求項４】　前記一対の封止部は、互いに異なる長さを有し、前記過昇温抑制手段は、前記透明部材側に長い方の前記封止部を、前記反射鏡の底部側に短い方の前記封止部を配置してなる請求項１記載のランプ装置。

【請求項５】　前記透明部材側に配置された前記封止部の端部が前記透明部材の近傍に位置する請求項４記載のランプ装置。

【請求項６】　前記過昇温抑制手段は、前記透明部材側に配置された前記封止部の熱をランプ装置の外側に伝導する導熱手段である請求項１記載のランプ装置。

【請求項７】　前記過昇温抑制手段は、前記透明部材側に配置された前記封止部が前記透明部材と一体化されてなる請求項１記載のランプ装置。

【請求項８】　前記過昇温抑制手段は、前記透明部材側に配置された前記封止部の先端部が前記透明部材の外側に突出してなる請求項１記載のランプ装置。

【請求項９】　ランプ装置の外側に伝導された熱を除去する冷却手段をさらに具備する請求項６～８のいずれかに記載のランプ装置。

【請求項１０】　発光物質が封入される管内に一対の電極が対向して配置された発光管と、前記発光管から延在する一対の封止部とを備え、前記一対の封止部は、互いに異なる長さを有する放電ランプ。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、発光管の内部に対向する一対の放電電極を有し、水銀および希ガス等が封入された放電ランプ、およびそのような放電ランプが反射鏡の内部に組み込まれて構成されたランプ装置に関するものである。このランプ装置は、例えば映像プロジェクタ用の光源などとして用いられる。

【０００２】

【従来の技術】従来より、例えば映像プロジェクタ用の光源などとして、凹面状の反射鏡内に高圧水銀蒸気放電ランプ等の放電ランプを設けたランプ装置が用いられている。放電ランプは、発光管の内部に、対向する一対の放電電極を備えるとともに水銀および希ガス等が封入されて構成されている放電電極には、発光管の内部を気密に保つために、発光管の両側に設けられた封止部に封入され溶接等によって接続された配線部材を介して電力が供給されるようになっている。また、放電電極間の距離は比較的短く設定され、アーク長の短いアーク（ショートアーク）を形成させることにより、所定の光学系に投射光を効率よく供給して明るい映像をスクリーンに投写し得るようになっている。

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【０００３】上記のような放電ランプは、点灯動作時に発光管が非常に高温になるという特徴を有している。具体的には、例えばランプ電力が１００～１５０Ｗクラスの一般的なショートアーク高圧水銀蒸気放電ランプでは、発光管の最高温度（発光管上部の管壁内面側）は約９００～１，０００℃になる。また、封止部の温度も５００℃程度、すなわち上記最高温度よりは低いが、やはりかなり高温になる。そこで、封止部内に配される配線部材は、モリブデン等の高融点金属からなる。しかしながら、この封止部の温度が上昇しすぎると、封止部内や封止部近傍にある配線部材の溶接部分の酸化腐食が進むなどして断線に至り、ランプが不点灯になるおそれがある。そこで、通常のプロジェクタでは、本体内に冷却ファンを設け、放電ランプや反射鏡の過度な温度上昇を抑制するようになっている。なお、上記のような配線部材の溶接部分の酸化等による断線を防止するためには、上記溶接部分の温度を例えばハロゲンランプについての規定である「ＩＥＣ（国際電気標準会議）６０３５７　Ｔｕｎｇｓｔｅｎ　ｈａｌｏｇｅｎ　ｌａｍｐｓ」や「ＪＩＳ（日本工業規格）　Ｃ　７５２７ハロゲン電球」に記載されている温度（３５０℃）を目安として設定することが考えられ、高くとも４００℃以下程度に抑えることが好ましい。

【０００４】また、放電ランプは、点灯動作時に発光管内部の圧力が非常に高圧になるという特徴も有している。具体的には、例えば上記のようにランプ電力が１００～１５０Ｗクラスの一般的な放電ランプでは、発光管内部の圧力（動作圧力）が２００気圧近くに達する。このため、ランプの点灯時に発光管が破損した場合、大きな破裂音がしたり、ガラス片が飛散したりしがちである。このような破裂音やガラス片の飛散が生じることは、例えば特に家庭用のプロジェクタに適用される場合などには、商品価値を低下させる要因となる。そこで、反射鏡の開口部を前面ガラスによって塞ぎ、破裂音やガラス片の飛散を低減するようにしたランプ装置が多く用いられている。ここで、反射鏡と前面ガラスとによってそれらの間に完全な密閉空間を形成すると、放電ランプの温度上昇が顕著になる。一方、放電ランプを冷却するために反射鏡または前面ガラスに切り欠き等を設け、内部に外気を流通させると、発光管が破損した際の破裂音

を大幅に低減したり、ガラス片の飛散や霧散する水銀蒸気の放出を確実に防止することが困難である。

【０００５】また、近年、投写映像の高輝度化やプロジェクタの小型化への要求が高まりつつある。しかしながら、これらの要求に伴なうランプ電力の増大や反射鏡サイズの小型化は、一層、放電ランプの温度上昇を招くために困難であった。そこで、高まる投写映像の高輝度化やプロジェクタの小型化の要求に充分に応えるためには、出力の増大や反射鏡の小型化に伴うランプ装置の温度上昇、とりわけその配線部材の溶接部分における温度上昇の効果的な抑制が求められていた。

【０００６】

【発明が解決しようとする課題】本発明は、上記の点に鑑み、ランプ電力を増大させたり反射鏡を小型化したりしても、配線部材の溶接部分などの酸化等による断線を防止でき、ランプの長寿命化や不良率の低下を図ることができる高圧蒸気放電ランプおよびランプ装置の提供を目的としている。併せて、本発明は、発光管の破裂音を低減し、ガラス片の飛散や水銀蒸気の放出を確実に防止できるランプ装置の提供を目的としている。

【０００７】

【課題を解決するための手段】上記の問題点を解決する請求項１に記載の発明は、発光物質が封入される管内に一対の電極が対向して配置された発光管および発光管から延在する（すなわち発光管と連結されている）一対の封止部とを備えた放電ランプと、放電ランプの発した光を反射する反射鏡と、反射鏡の開口部を覆い、反射鏡との間の空間に放電ランプを収容する透明部材と、放電ランプの電極に電気的に接続された配線部材の溶接箇所の温度上昇を抑制する過昇温抑制手段とを備えたランプ装置である。

【０００８】すなわち、本発明では、放電ランプが反射鏡とそれを覆う透明部材により構成される空間部に収容されたランプ装置において、ランプの発光に伴なう発熱による配線部材やそれらの溶接箇所の温度上昇を抑制するための手段を設ける。これにより配線部材の溶接箇所の熱劣化を抑制することができ、その箇所における断線を防止し、ランプの長寿命化や不良率の低下を図ることが可能になる。また、要望されているランプ電力の増大や、反射鏡の小型化に容易に対応することが可能になる。

【０００９】請求項２に記載の発明は、請求項１記載のランプ装置であって、放電ランプが、箔封止構造を有する。本発明は、広く用いられているいわゆる箔封止構造の放電ランプに有用である。箔封止構造の放電ランプでは、封止部を構成するガラスとの間で熱衝撃のダメージや両者の熱膨張率の違いに関わらず密着性を維持して、電極等が配された空間部の密閉度が維持されるよう、封止部中の配線部材として大きな接触面積を確保することができる金属箔が用いられている。金属箔の一端は、封

止部の端部において、外部電源に接続された導電部材と溶接により接続される。過昇温抑制手段を設けることで、この高温になる封止部中の金属箔と配線部材との溶接箇所において過度の温度上昇を抑制することができる。また、封止部外でその近傍に位置する配線部材の溶接箇所においても温度上昇を抑制することができる。

【００１０】もちろん、例えばロッド状の配線部材を封止部に封止した放電ランプや、電極が封止部を貫通した放電ランプなど、箔封止構造を有さない放電ランプを用いたランプ装置においても、これらと他の配線部材との溶接箇所において断線を防止することができる。

【００１１】請求項３に記載の発明は、請求項１記載のランプ装置であって、放電ランプを収容する反射鏡および透明部材の内部が気密に密閉されている。これにより、発光管が破損した場合に、破裂音を大幅に低減することができ、また、ガラス片の飛散や霧散する水銀蒸気の放出を確実に防止することができる。

【００１２】請求項４に記載の発明は、請求項１記載のランプ装置であって、一対の封止部が互いに異なる長さを有し、過昇温抑制手段は、透明部材側に長い方の封止部を、反射鏡の底部側に短い方の封止部を配置してなる。より具体的には、請求項５記載のように、透明部材側に配置される封止部の端部が透明部材の近傍に位置するように設定されることが好ましい。

【００１３】ランプ装置においては、透明部材側の封止部は反射鏡の底部側の封止部に比べてより高温になることから、透明部材側の封止部にある配線部材の溶接箇所は、他方の封止部にある配線部材の溶接箇所よりも熱による劣化が生じやすい。また、箔封止構造の放電ランプにおいては、より温度が高くなる金属箔と放電電極との溶接箇所よりも、金属箔と外部電源に接続された側の導電部材との溶接箇所の方が、気密性が低いことから熱による劣化が生じやすい。そこで、上記のように封止部の長さを設定することにより、透明部材側の封止部の先端部から発光部までの距離が他方のそれよりも長くなるので、透明部材側の封止部の先端部の温度を低く抑えることができ、透明部材側の封止部先端やその近傍に位置する配線部材の溶接部などの酸化等による断線を防止することができる。

【００１４】また、請求項６に記載の発明は、請求項１記載のランプ装置であって、過昇温抑制手段が、透明部材側に配置された封止部の熱をランプ装置の外側に伝導する導熱手段である。導熱手段としては、例えば一端を封止部に巻きつけ、他端をランプ装置の外部にまで延ばした銅板やヒートパイプなどを用いることができる。このような導熱手段を介して、封止部の熱がランプ装置の外部に放熱されるので、やはり、封止部の先端部の温度を低く抑えることができ、配線部材の溶接部などの酸化等による断線を防止することができる。

【００１５】また、請求項７に記載の発明は、請求項１

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記載のランプ装置であって、過昇温抑制手段が、透明部材側に配置された封止部が透明部材と一体化されてなる。これにより、封止部の先端部の熱は透明密閉部材の外面等から放熱されるため、やはり、封止部の先端部の温度を低く抑えることができ、配線部材の溶接部などの酸化等による断線を防止することができる。

【００１６】また、請求項８に記載の発明は、請求項１記載のランプ装置であって、過昇温抑制手段が、透明部材側に配置された封止部の先端部が透明部材の外側に突出してなる。これにより、封止部の先端部は外気によって冷却されるので、やはり、封止部の先端部の温度を低く抑えることができ、配線部材の溶接部などの酸化等による断線を防止することができる。

【００１７】また、請求項９に記載の発明は、請求項６ないし請求項８に記載のランプ装置であって、さらに、ランプ装置の外方側に伝導した熱を放熱または吸熱する冷却手段を備える。冷却手段としては、例えば冷却ファンや、放熱フィン、ペルチェ素子冷却モジュールなどを用いることができる。これにより、導熱手段によって伝導した熱や、透明密閉部材の表面や周辺部に伝導した熱、または突出した封止部の先端部の熱を効率よく放熱することができるので、封止部の先端部の温度を容易に低く抑えることができる。

【００１８】また、請求項１０に記載の発明は、発光物質が封入される管内に一対の電極が対向して配置された発光管と、発光管から延在する一対の封止部とを備え、一対の封止部は、互いに異なる長さを有する高圧蒸気放電ランプである。このような高圧蒸気放電ランプを用いることにより、例えば請求項４に記載のように、封止部の先端部の温度を低く抑えて配線部材の溶接部などの酸化等による断線を防止し得るランプ装置を構成することができる。

【００１９】

【発明の実施の形態】以下、本発明の好ましい実施の形態として、高圧水銀蒸気放電ランプを用いたランプ装置の例を図面を用いて詳細に説明する。

【００２０】《実施の形態１》封止部の長さが非対称に形成された高圧水銀蒸気放電ランプ、および上記放電ランプを用いたランプ装置について説明する。ランプ装置１０は、図１に示すように、例えば楕円面状の反射面１１ａを有し、開口部の直径が８０ｍｍの反射鏡１１を有する。反射鏡１１の内部には、例えばランプ電力（定格電力）が２００Ｗの放電ランプ２１が配されている。反射鏡１１の開口部は前面ガラス１２によって密閉され、放電ランプ２１が破損した場合でも、大きな破裂音や、ガラス片の飛散、水銀蒸気の放出などが確実に防止されるようになっている。

【００２１】放電ランプ２１は、発光管２２の両端にそれぞれ連結された一対の封止部２３および２４を有する。封止部２３および２４は長さが互いに異なり、前面

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ガラス１２側の封止部２３は他方の封止部２４よりも長い。また、封止部２３の先端が前面ガラス１２の近傍に位置するように設定されている。発光管２２の内部には、例えばタングステンから成るコイル状または棒状の１対の放電電極２５が設けられるとともに、水銀２６および希ガス等（図示せず）の発光物質が封入されている。なお、放電ランプ２１としては、上記のような高圧水銀蒸気放電ランプに限らず、封入物質として、さらに、ハロゲンガスやハロゲン化金属などが封入されたものや、水銀を含まないものなどでもよい。

【００２２】封止部２３および２４は、それぞれ電極２５に電気的に接続されたモリブデン等の高融点金属からなる金属箔２７および２８と発光管２２から延ばされたガラス管とを有し、金属箔２７および２８とガラス管との箔封止によって発光管２２の放電空間の気密性が保持されている。一対の放電電極２５は、それぞれ、封止部２３および２４の内部に封止されたたとえばモリブデンからなる金属箔２７および２８の一端部に溶接されている。金属箔２７および２８の他端部は、図２に示すように、端部が封止部２３および２４の外部に露出したモリブデンからなる金属ロッド２９および３０に溶接部２９ａおよび３０ａで溶接されている。金属ロッド２９はリード線３１に溶接部３１ａで溶接されている。一方、金属ロッド３０は封止部２４の端部を覆う口金３２に溶接されている。上記のように封止部２３および２４内に封止された金属箔２７および２８を介して放電電極２５と金属ロッド２９および３０とが接続されているのは、発光管２２内部の密閉度を高めて高圧状態が維持されるようにするためである。すなわち、金属ロッド２９および３０は、ガラスとの熱膨張率の相違等から、封止部２３および２４との密着性を高めることが必ずしも容易ではない。これに対して、金属箔２７および２８は非常に薄く、かつ、封止部２３および２４との接触面積が大きく、密着性を容易に高めることができるため、発光管２２の内部を容易に高圧に保つことができる。

【００２３】放電ランプ２１は一対の放電電極２５間のギャップ（アーク発光部）が反射鏡１１の楕円面における第１焦点に位置するように配置され、口金３２の部分で、反射鏡１１の底部に形成されたランプ固定穴１１ｂにセメント３３を介して密封固定されている。また、放電ランプ２１のリード線３１は、反射鏡１１の壁面に形成されたリード線穴１１ｃを介して反射鏡１１の外部に取り出されている。上記リード線穴１１ｃもセメント３４によって密封されている。

【００２４】上記のように前面ガラス１２側の封止部２３が口金３２側の封止部２４よりも長く形成されることにより、金属箔２７と金属ロッド２９との溶接部２９ａと、放電ランプ２１の発光部との距離が長くなるため、上記溶接部２９ａの温度上昇を抑えることができる。実際に温度を測定したところ、封止部２３および２４の長

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さがいずれも２５ｍｍである放電ランプ２１を２００Ｗのランプ電力で点灯させた場合、発光管２２の最高温度（発光管上部の管壁内面側）が１，０００℃近くに達すると、溶接部２９ａの温度は５０７℃まで上昇したのに対し、封止部２３の長さを３５ｍｍとし、封止部２４の長さを２５ｍｍとした放電ランプ２１の場合には、溶接部２９ａの温度は最高３８８℃であった。この温度は、ハロゲンランプについての規定であるＩＥＣ６０３５７に記載されている温度（３５０℃）よりは高いが、金属箔２７や金属ロッド２９、およびこれらの溶接部２９ａの酸化腐食等を防止するためには十分に低い温度である。それゆえ、金属ロッド２９と封止部２３との密着性が低下して上記溶接部２９ａ等がランプ装置１０内の空気に触れたとしても、酸化腐食等による断線を防止することができる。同様に、金属ロッド２９とリード線３１との溶接箇所３１ａにおける温度上昇も抑制することができ、溶接箇所３１ａにおける断線も防止することができる。したがって、図１に示す箔封止構造の放電ランプを用いたランプ装置に限らず、金属箔２７および金属ロッド２９に代えて単一のロッド状配線部材を用いた場合や、金属箔２７を用いずに電極２５を直接それぞれ封止部２３を貫通させ、その端部を外部に露出させた場合においても、これらとリード線３１との溶接箇所における断線を防止することができる。

【００２５】ここで、上記のように反射鏡１１として楕円面鏡を用いて第１焦点の近傍に発光部を設ける場合、反射鏡１１で反射された光は第２焦点に集光するため、封止部２３の先端部が第２焦点に近づくほど反射光による加熱作用は大きくなると考えられる。しかし、通常は、封止部２３の先端部が発光部から遠ざかることによる温度低下作用の方が大きいため、上記のように封止部２３の先端部の温度を低く抑えることができる。なお、封止部２３の全長にわたって、または封止部２３の先端部もしくは溶接部２９ａ付近などにおける封止部２３の外周に反射層を形成して、上記反射光による加熱作用を低減し、より封止部２３の先端部の温度を低く抑え得るようにしてもよい。また、放電ランプ２１のランプ電力が小さい場合など、反射光による加熱作用を低減するだけで封止部２３の先端部の温度を低く抑え得る場合には、必ずしも封止部２３を封止部２４よりも長くしなくてもよい。

【００２６】《実施の形態２》放電ランプの封止部付近の熱を反射鏡の外部に放熱する手段を備えたランプ装置の例を説明する。なお、以下の実施の形態において、実施の形態１等のランプ装置と同様の機能を有する構成要素については同一の番号を付して説明を省略する。このランプ装置１０には、図３～図５に示すように、放電ランプ２１の封止部２３付近の熱を反射鏡１１の外部に放熱する放熱装置４１が設けられている。この放熱装置４１は、熱伝導率の高い材料例えば銅板から成り、封止部

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２３にほぼ全長にわたって巻きつけられた吸熱部４１ａと、吸熱部４１ａの熱を反射鏡１１の外部に導く導熱部４１ｂと、導かれた熱を放熱する放熱部４１ｃとから構成されている。

【００２７】銅板等を封止部２３の外周に単に巻きつけて構成された吸熱部４１ａでも所定の効果は得られるが、より大きな効果を得るためには、吸熱部４１ａと封止部２３を密着させる。例えば封止部２３よりも低融点のガラス粉を介在させて銅板を巻きつけた後に加熱して密着させる。また、吸熱部４１ａは、封止部２３との密着面積（密着長さ）が大きいほど吸熱効果が高いが、封止部２３のほぼ全長にわたって巻きつけるものに限らず、溶接部２９ａ付近の温度上昇を抑制し得る範囲で部分的に巻きつけたものなどでもよい。

【００２８】導熱部４１ｂは、光軸方向の投影面積、すなわち投射光の影になる部分が小さくなるように、銅板面が前面ガラス１２と垂直になるように設けられている。また、反射鏡１１における導熱部４１ｂが外部に導出される部分は、例えば図３に示すようにセメント４２によって密封されている。導熱部４１ｂの幅は、図３においては吸熱部４１ａの幅よりも狭く設定されている例を示しているが、吸熱部４１ａと同じ幅にするなどしてもよい。放熱部４１ｃには、例えば放熱フィンなどの冷却装置４３が設けられている。なお、冷却装置４３として、放熱フィンに代えて、冷却ファン、ペルチェ素子を用いた冷却モジュール、水冷の冷却装置などを用いることもできる。熱伝導性の高い筐体を冷却装置４３として用いてもよい。また、冷却装置４３としてこれらを組み合わせてもよい。また、反射鏡１１と前面ガラス１２により囲まれた空間部の気体を外部に配されたラジエータとの間で循環させて、ランプ装置内を冷却するようにしてもよい。

【００２９】上記の構成により、放電ランプ２１の発光部から熱伝導などによって封止部２３に伝わった熱は、吸熱部４１ａから導熱部４１ｂを介して、反射鏡１１の外側の放熱部４１ｃに伝導され、放熱される。それゆえ、封止部２３の温度を低く保つことができ、金属ロッド２９と金属箔２７との溶接部２９ａの酸化腐食等による断線を防止することができる。また、少なくとも封止部２３の先端部付近に吸熱部４１ａが設けられる場合には、金属ロッド２９とリード線３１との溶接部３１ａの酸化腐食等による断線の防止効果をより一層高めることができる。

【００３０】なお、放熱装置４１の材料は、上記のように銅板に限らず、比較的熱伝導率の大きい材料であれば同様の冷却効果を得ることができる。また、導熱部４１ｂなどにヒートパイプや冷媒を強制的に循環させる細管等を用いるようにしてもよい。この場合には、上記ヒートパイプや細管をリード線３１に添わせて、反射鏡１１の外部に引き出すようにしてもよく、特に、ヒートパイ

プや細管とリード線３１とを同軸構造にすることにより、これらによって遮られる投射光を少なく抑えることが容易にできる。また、導熱部４１ｂは１か所だけに設けるものに限らず、例えば図６に示すように複数箇所に設けて、より放熱量が大きくなるようにしてもよい。また、図３の例においては、封止部２３と封止部２４のの長さが等しく設定された例を示しているが、これに限らず、実施の形態１と同様に封止部２３の方が長くなるようにしてもよいし、また、放熱装置４１による放熱効果が十分得られる場合には、封止部２３の方が短くなるようにしてもよい。

【００３１】《実施の形態３》放電ランプを前面ガラスと一体的に形成して、封止部の先端が外気に触れるように構成されたランプ装置の例を説明する。図７に示すように、放電ランプ２１は、封止部２３の端部が前面ガラス１２と一体的に形成され、金属ロッド２９の先端部とリード線３１との溶接部３１ａは前面ガラス１２の外面側に露出している。また、前面ガラス１２の近傍には、１２の外面に外気を吹き付ける冷却ファン５１が設けられている。上記のように構成されていることにより、封止部２３の先端部の熱は前面ガラス１２の外面等から放熱されるため、金属箔２７と金属ロッド２９との溶接部２９ａ付近の温度は低く抑えられ、溶接部２９ａなどの酸化腐食等による断線が防止される。

【００３２】なお、上記冷却ファン５１に代えて、前面ガラス１２の外周部付近に、投射光を遮らないように放熱フィンやペルチェ素子を用いた冷却モジュールなどを設けたり、また、これらを組み合わせるなどしてもよい。さらに、前面ガラス１２の外面付近の自然対流などによって溶接部２９ａ付近の温度が十分に低く抑えられる場合には、冷却ファン５１などを設けなくてもよい。また、図７の例においては、封止部２３の先端は前面ガラス１２の表面よりもわずかに突出しているだけだが、ランプ装置１０の全長（光軸方向の長さ）が長くてもよい場合には、図８に示すように、さらに突出させるようにしてもよい。このように溶接部２９ａが前面ガラス１２の表面よりもほぼ外方側に位置するようにすれば、さらに溶接部２９ａ付近の温度を低く抑えることが容易にできる。

【００３３】また、図７の例においては、封止部２３の長さは実施の形態１と同様に封止部２４よりも長く設定された例を示しているが、これに限るものではない。すなわち、放電ランプ２１の発光部と溶接部２９ａとの距離が短い場合でも、溶接部２９ａ付近の温度は前面ガラス１２の表面からの放熱によって低く抑えられるので、図９に示すように封止部２３が封止部２４と同じ長さか、または短くなるように設定することもできる。それゆえ、反射鏡１１の大きさに比べて比較的大きなサイズの放電ランプ２１を用いたランプ装置１０を構成することも容易にできる。また、上記のように放電ランプと前面ガラスとを一体的に形成した構成に加えて、実施の形態３で示した放熱装置４１を設けるようにしてもよい。

【００３４】《実施の形態４》実施の形態３と同様に、放電ランプを前面ガラスと一体的に形成して、封止部の先端が外気に触れるように構成されたランプ装置の他の例を説明する。図１０に示すように、前面ガラス１２には、中央部に穴１２ａが形成され、封止部２３の端部が貫通するように設けられている。封止部２３と穴１２ａとの間の隙間は、例えば前面ガラス１２および封止部２３とは異なる材料の充填剤５２によって接着、密封されている。充填剤は、より具体的には、例えば前面ガラス１２や封止部２３よりも融点の低いガラスなどの透光性材料であることが好ましい。

【００３５】このように、前面ガラス１２と封止部２３を別途形成した後、両者を接合することで、前面ガラス１２と一体化された発光管２１を用いる実施の形態３のランプ装置と比べて製造工程がより容易になる。上記のように構成されている場合にも、実施の形態３と同様に、封止部２３の先端部の熱は前面ガラス１２の外面等から放熱されるため、やはり、金属箔２７と金属ロッド２９との溶接部２９ａ付近の温度は低く抑えられ、溶接部２９ａなどの酸化腐食等による断線が防止される。なお、本実施の形態においても、実施の形態３で説明したのと同様な種々の変形が適用可能である。

【００３６】なお、上記各実施の形態においては、反射鏡として楕円面鏡を用いた例を示したが、これに限らず放物面鏡などの凹面鏡を用いてもよい。なお、上記実施の形態では、いずれも動作圧力が約２００気圧の放電ランプを用いた例について説明したが、本発明は、より低圧、例えば１００気圧以下で動作する放電ランプを用いたランプ装置にも適用することができる。また、本発明は、実施の形態で説明した箔封止構造の放電ランプを用いたランプ装置に限らず、放電ランプの近傍に高温により熱劣化が懸念される配線部材の溶接箇所が配されたあらゆる放電ランプを用いたランプ装置に適応可能である。また、ランプ装置内の気体については特に記載していないが、空気を封入してもよいし、アルゴンガスなどの不活性ガスを封入してもよい。また、上記各構成に加えて、または上記各構成に代えて、ランプ装置内の気体を外部のラジエータとの間で流通させて、ランプ装置内を冷却するようにしてもよい。

【００３７】

【発明の効果】本発明によると、封止部の先端部の温度を低く抑えることができ、配線部材の溶接部などの酸化等による断線を防止することができるので、ランプの長寿命化や不良率の低下を図ることができる。さらにランプ電力を増大させたり反射鏡を小型化したりすることも容易にできる。また、本発明によると、ランプ装置を密閉しても装置内部の過度の温度上昇を抑制することができることから、発光管の破裂音を抑制することができ、

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さらにガラス片の飛散や水銀蒸気の放出を確実に防止することができる。

【図面の簡単な説明】

【図１】実施の形態１のランプ装置を示す縦断面図である。

【図２】同ランプ装置に用いる放電ランプを示す縦断面図である。

【図３】実施の形態２のランプ装置を示す縦断面図である。

【図４】同ランプ装置の要部を示す縦断面図である。

【図５】同ランプ装置の一部を切り欠いた正面図である。

【図６】実施の形態２の他のランプ装置を示す正面図である。

【図７】実施の形態３のランプ装置を示す縦断面図である。

【図８】実施の形態２の他のランプ装置を示す縦断面図である。

【図９】実施の形態３のさらに他のランプ装置を示す縦断面図である。

【図１０】実施の形態４のランプ装置を示す縦断面図である。

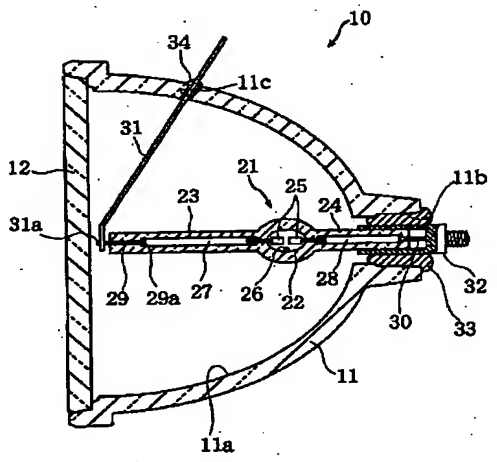
【符号の説明】

１０　ランプ装置
１１　反射鏡

12

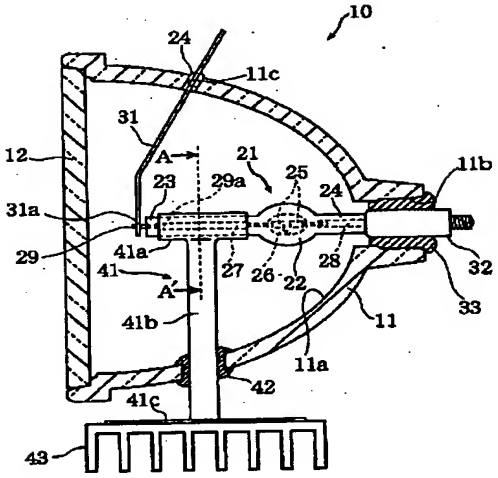
１１ａ　反射面
１１ｂ　ランプ固定穴
１１ｃ　リード線穴
１２　前面ガラス
１２ａ　穴
１２　前面ガラス
２２　発光管
２３　封止部
２４　封止部
２５　放電電極
２６　水銀
２７、２８　金属箔
２９、３０　金属ロッド
２９ａ、３０ａ　溶接部
３１　リード線
３１ａ　溶接部
３２　口金
３３、３４、４２　セメント
４１　放熱装置
４１ａ　吸熱部
４１ｂ　導熱部
４１ｃ　放熱部
４３　冷却装置
５１　冷却ファン
５２　充填材

【図１】

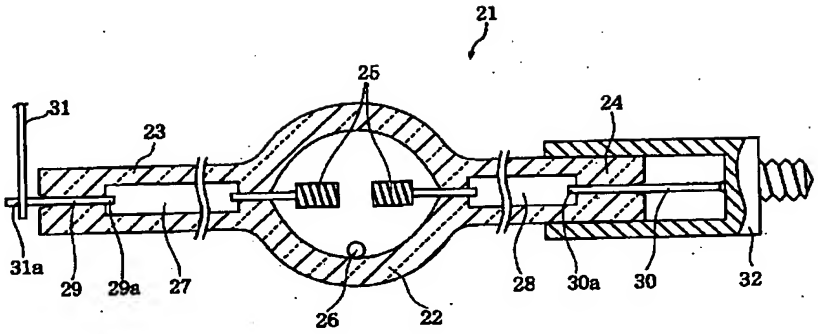


10　ランプ装置
11　反射鏡
12　前面ガラス
22　発光管
23、24　封止部
25　放電電極
27、28　金属箔
29、30　金属ロッド
29a、30a、31a　溶接部
31　リード線

【図３】



【図２】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31a
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29a
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30a
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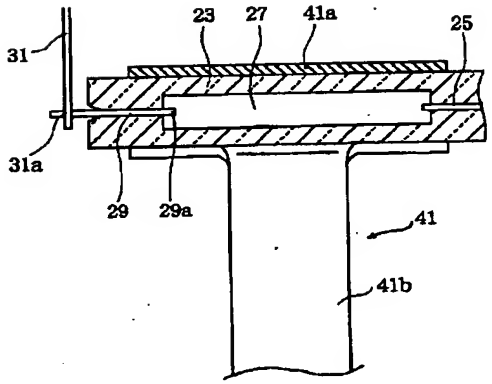
【図４】


23
27
41a
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31
31a
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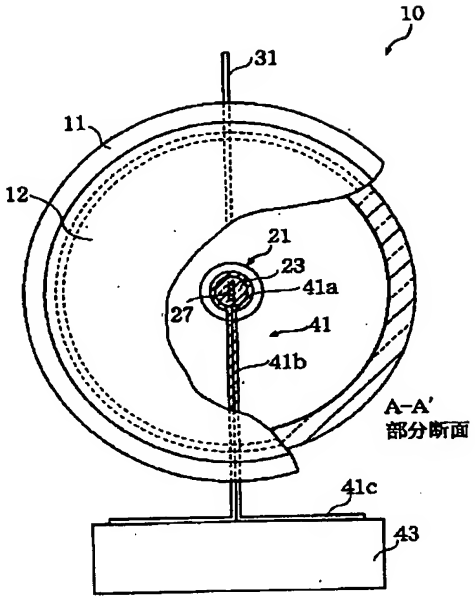
29a
41
41b

【図５】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31
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12
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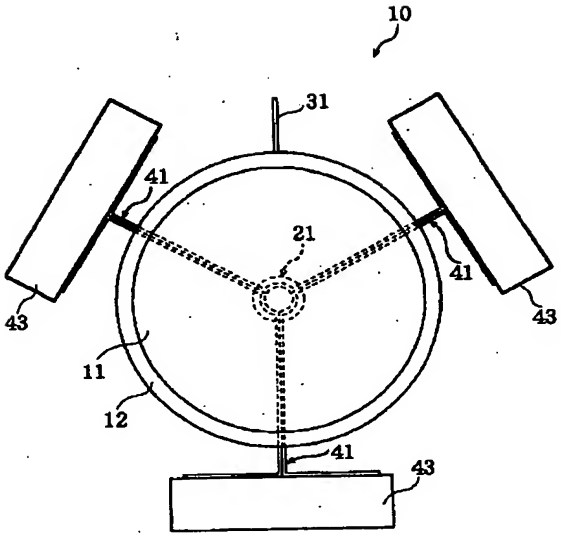
23
41a
27
41
41b
A-A'
部分断面
41c
43

【図６】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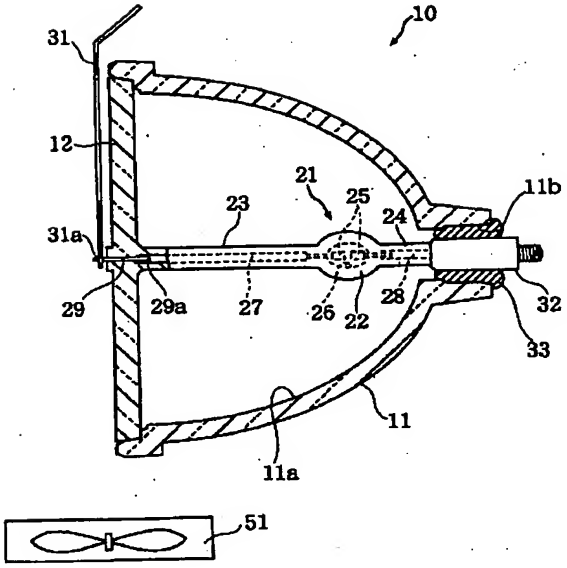
【図７】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11b
31a
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29a
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11a
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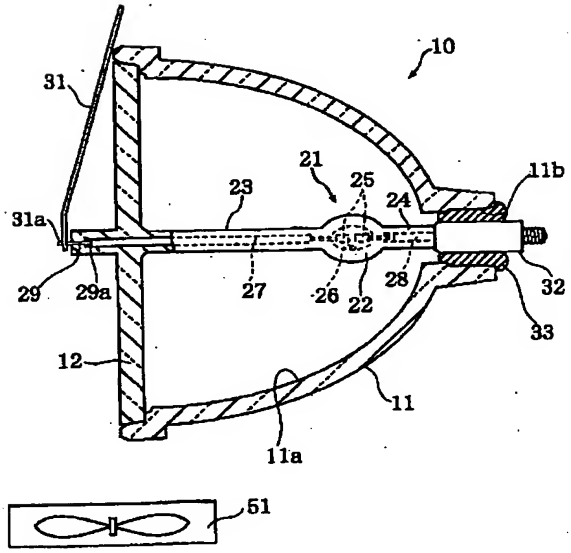
【図８】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11a
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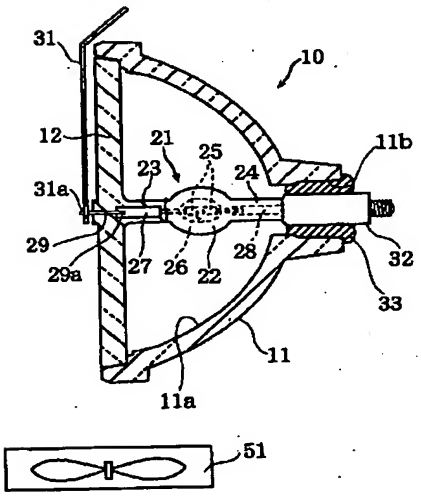
【図９】


31
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11b
31a
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29a
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11a
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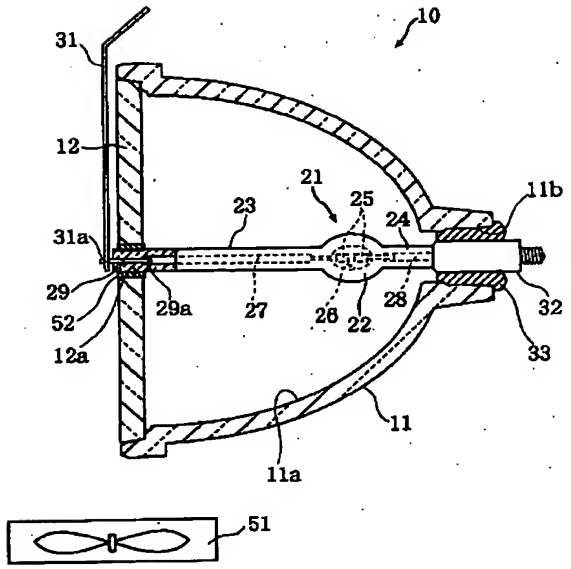
【図１０】



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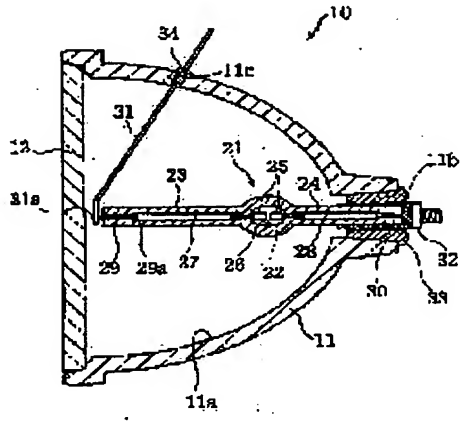
(54) DISCHARGE LAMP AND LAMP APPARATUS

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a high pressure vapor discharge lamp and its apparatus being able to prevent wire disconnection due to oxidization, etc., of the welded part or the like of wiring members, to attain a longer life of the lamp and to reduce the defective rate while the lamp power is increased and the reflector is down-sized.

SOLUTION: The lamp comprises a luminescent material including light- emission tube where a pair of electrodes are opposingly arranged inside, a discharge lamp equipped with a pair of the sealing portions extended from the light-emission tube, a reflector reflecting the light emitted by the discharge lamp, a transparent member covering the reflector opening and accommodating the discharge lamp in the space with the reflector, excessive temperature rise restraining means to restrain the temperature rise at the welded points of the wiring members electrically connected to the discharge lamp electrodes.



10 ランプ装置
11 反射鏡
12 前面ガラス
22 発光管
23、24 封止部
25 放電電極
27、28 金属箔
29、30 金属ニッド
29a、30a、31a 芯接部
31 リード線

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[Patent number] 3330134

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The discharge lamp equipped with the closure section of the pair which extends from the arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, and said arc tube, The reflecting mirror which reflects the light which said discharge lamp emitted, and the transparence member which covers opening of said reflecting mirror and holds said discharge lamp in the space between said reflecting mirrors, Lamp equipment possessing a fault temperature up control means to control the temperature rise of the welding part of the wiring member electrically connected to the electrode of said discharge lamp.
[Claim 2] The closure section of said discharge lamp is lamp equipment according to claim 1 which is foil closure structure.
[Claim 3] Lamp equipment according to claim 1 with which the interior of said reflecting mirror which holds said discharge lamp, and said transparence member is sealed airtightly.
[Claim 4] The closure section of said pair is lamp equipment according to claim 1 with which it has mutually different die length, and said fault temperature up control means comes to arrange said closure section of the longer one said closure section of the shorter one to said transparence member side at the pars-basilaris-ossis-occipitalis side of said reflecting mirror.
[Claim 5] Lamp equipment according to claim 4 with which the edge of said closure section arranged at said transparence member side is located near said transparence member.
[Claim 6] Said fault temperature up control means is lamp equipment according to claim 1 which is a conductive-heat means to conduct the heat of said closure section arranged at said transparence member side on the outside of lamp equipment.
[Claim 7] Said fault temperature up control means is lamp equipment according to claim 1 with which it comes to unite with said transparence member said closure section arranged at said transparence member side.
[Claim 8] Said fault temperature up control means is lamp equipment according to claim 1 which the point of said closure section arranged at said transparence member side comes to project on the outside of said transparence member.
[Claim 9] Lamp equipment according to claim 6 to 8 which possesses further a cooling means to remove the heat conducted on the outside of lamp equipment.
[Claim 10] It is the discharge lamp which is equipped with the arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, and the closure section of the pair which extends from said arc tube, and has the die length from which the closure section of said pair differs mutually.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention has the discharge electrode of the pair which counters the interior of an arc tube, and relates to the lamp equipment with which the discharge lamp with which mercury, rare gas, etc. were enclosed, and such a discharge lamp were built into the interior of a reflecting mirror, and were constituted. This lamp equipment is used as the light source for for example, image projectors etc.
[0002]
[Description of the Prior Art] Conventionally, the lamp equipment which prepared discharge lamps, such as a high-pressure mercury vapour discharge lamp, in the concave surface-like reflecting mirror is used as the light source for for example, image projectors etc. Power is supplied through the wiring member which was enclosed with the closure section by which the discharge lamp was prepared in the interior of an arc tube at the both sides of an arc tube in order to keep the interior of an arc tube airtight to the discharge electrode which mercury, rare gas, etc. enclose and consist of while having the discharge electrode of the pair which counters, and was connected by welding etc. Moreover, by being set up comparatively short and making an arc with the short arc length (short arc) form, the distance between discharge electrodes can supply incident light to predetermined optical system efficiently, and can project a bright image now on a screen.
[0003] The above discharge lamps have the description that an arc tube becomes an elevated temperature very much at the time of lighting actuation. Specifically with a short arc high-pressure mercury vapour discharge lamp with lamp power common [100 - 150W class], the maximum temperature (tube wall inside side of the arc tube upper part) of an arc tube becomes about 900-1,000 degrees C. Moreover, although the temperature of the closure section is also lower than about 500 degrees C, i.e., the above-mentioned maximum temperature, it becomes an elevated temperature considerably too. Then, the wiring member allotted to closure circles consists of refractory metals, such as molybdenum. However, when the temperature of this closure section rises too much, the oxidation corrosion of the weld of the wiring member closure circles and near the closure section progresses, it results in an open circuit, and there is a possibility that a lamp may be un-switching on the light. So, in the usual projector, a cooling fan is formed in a body and too much temperature rise of a discharge lamp or a reflecting mirror is controlled. In addition, in order to prevent the open circuit by oxidation of the weld of the above wiring members etc., it is desirable for it to be possible to set up as a standard the temperature (350 degrees C) indicated by "IEC(Electrotechnical International Commission) 60357 Tungsten halogen lamps" which is the convention about a halogen lamp, and "JIS(Japanese Industrial Standards) C 7527 tungsten halogen lamp" in the temperature of the above-mentioned weld, and to hold down that it is high to 400-degree-C or less extent.
[0004] Moreover, the discharge lamp also has the description that the pressure inside an arc tube becomes high pressure very much at the time of lighting actuation. Specifically, the pressure inside an arc tube (working pressure) reaches near the 200 atmospheric pressures as mentioned above in a discharge lamp with lamp power common [100 - 150W class]. For this reason, when an arc tube is damaged at the time of lighting of a lamp, a loud explosive sound tends to carry out or the piece of glass tends to disperse. That scattering of such an explosive sound or the piece of glass arises becomes the factor which reduces commodity value, when applied for example especially to a projector for home use. Then, a front windshield closes opening of a reflecting mirror and many lamp equipments which reduced scattering of an explosive sound or the piece of glass are used. Here, if a perfect closed space is formed among them with a reflecting mirror and a front windshield, the temperature rise of a discharge lamp will become remarkable. On the other hand, if notching etc. is prepared in a reflecting mirror or a front windshield and the open air is circulated inside in order to cool a discharge lamp, it is difficult to reduce sharply the explosive sound at the

time of an arc tube being damaged, or to prevent certainly scattering of the piece of glass, and the dispelling emission of mercury vapour.
[0005] Moreover, the demand to a raise in the brightness of a projection image or the miniaturization of a projector is increasing in recent years. However, much more, the increase of lamp power and the miniaturization of reflecting mirror size accompanying these demands were difficult in order to cause the temperature rise of a discharge lamp. So, in order to fully meet the increasing demand of a raise in the brightness of a projection image, or a miniaturization of a projector, the temperature rise of the lamp equipment accompanying increase of an output or the miniaturization of a reflecting mirror and effective control of a temperature rise [in / it divides and / the weld of the wiring member] were called for.
[0006]
[Problem(s) to be Solved by the Invention] Even if it increases lamp power or this invention miniaturizes a reflecting mirror in view of the above-mentioned point, it can prevent the open circuit by oxidation of the weld of a wiring member etc., and aims at offer of the high-pressure-steam discharge lamp which can aim at reinforcement of a lamp, and decline in a percent defective, and lamp equipment. It combines, and this invention reduces the explosive sound of an arc tube, and aims at offer of the lamp equipment which can prevent certainly scattering of the piece of glass, and emission of mercury vapour.
[0007]
[Means for Solving the Problem] Invention according to claim 1 which solves the above-mentioned trouble The discharge lamp equipped with the closure section of the pair (that is, it connects with the arc tube) which extends from the arc tube and arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, It is lamp equipment equipped with a fault temperature up control means to control the temperature rise of the welding part of the reflecting mirror which reflects the light which the discharge lamp emitted, the transparence member which covers opening of a reflecting mirror and holds a discharge lamp in the space between reflecting mirrors, and the wiring member electrically connected to the electrode of a discharge lamp.
[0008] That is, in this invention, the means for controlling the temperature rise of the wiring members by generation of heat accompanying luminescence of a lamp or those welding parts is established in the lamp equipment with which the discharge lamp was held in the space section constituted by the wrap transparence member in a reflecting mirror and it. The heat deterioration of the welding part of a wiring member can be controlled by this, the open circuit in the part is prevented, and it becomes possible to aim at reinforcement of a lamp, and decline in a percent defective. Moreover, it becomes possible to correspond to increase of the lamp power currently demanded, and the miniaturization of a reflecting mirror easily.
[0009] Invention according to claim 2 is lamp equipment according to claim 1, and a discharge lamp has foil closure structure. This invention is useful to the discharge lamp of the so-called foil closure structure used widely. In the discharge lamp of foil closure structure, the metallic foil which can secure the big touch area as a wiring member in the closure section is used so that it may not be concerned with the difference in the damage of a thermal shock, or both coefficient of thermal expansion between the glass which constitutes the closure section, but adhesion may be maintained and whenever [sealing / of the space section on which the electrode etc. was arranged] may be maintained. The end of a metallic foil is connected in the edge of the closure section by the conductive member and welding which were connected to the external power. By establishing a fault temperature up control means, an extremes-of-temperature rise can be controlled in the welding part of the metallic foil in the closure section which becomes this elevated temperature, and a wiring member. Moreover, also in the welding part of the wiring member located in the near, a temperature rise can be controlled by the closure outside.
[0010] Of course, also in the lamp equipment using discharge lamps which do not have foil closure structure, such as a discharge lamp which closed the rod-like wiring member in the closure section, for example, and a discharge lamp with which the electrode penetrated the closure section, an open circuit can be prevented in the welding part of these and other wiring members.
[0011] Invention according to claim 3 is lamp equipment according to claim 1, and the interior of the reflecting mirror which holds a discharge lamp, and a transparence member is sealed airtightly. Thereby, when an arc tube is damaged, an explosive sound can be reduced sharply and scattering of the piece of glass and the dispelling emission of mercury vapour can be prevented certainly.
[0012] Invention according to claim 4 is lamp equipment according to claim 1, it has the die length from which the closure section of a pair differs mutually, and a fault temperature up control means comes to arrange the closure section of the longer one the closure section of the shorter one to a transparence member side at the pars-basilaris-ossis-occipitalis side of a reflecting mirror. More specifically, it is desirable to be

set up so that the edge of the closure section arranged like at a transparence member side according to claim 5 may be located near the transparence member.

[0013] In lamp equipment, since the closure section by the side of a transparence member becomes an elevated temperature more compared with the closure section by the side of the pars basilaris ossis occipitalis of a reflecting mirror, degradation by heat tends to produce the welding part of the wiring member in the closure section by the side of a transparence member rather than the welding part of the wiring member in the closure section of another side. Moreover, in the discharge lamp of foil closure structure, since airtightness is [the welding part with the conductive member of the side connected with the metallic foil at the external power] lower than the welding part of the metallic foil and discharge electrode with which temperature becomes high more, it is easy to produce degradation by heat. Then, since the distance from the point of the closure section by the side of a transparence member to a light-emitting part becomes longer than that of another side by setting up the die length of the closure section as mentioned above, the temperature of the point of the closure section by the side of a transparence member can be suppressed low, and the open circuit by oxidation of the weld zone of a wiring member located in the closure section tip by the side of a transparence member or its near etc. can be prevented.

[0014] Moreover, invention according to claim 6 is lamp equipment according to claim 1, and is a conductive-heat means by which a fault temperature up control means conducts the heat of the closure section arranged at the transparence member side on the outside of lamp equipment. As a conductive-heat means, an end can be twisted around the closure section, for example, and a copper plate, a heat pipe, etc. which extended the other end even to the exterior of lamp equipment can be used. Since the heat of the closure section radiates heat to the exterior of lamp equipment through such a conductive-heat means, too, the temperature of the point of the closure section can be suppressed low and the open circuit by oxidation of the weld zone of a wiring member etc. can be prevented.

[0015] Moreover, it comes to unite with a transparence member the closure section by which invention according to claim 7 is lamp equipment according to claim 1, and the fault temperature up control means has been arranged at the transparence member side. Thereby, since the heat of the point of the closure section radiates heat from the external surface of a transparence sealing member etc., too, it can suppress the temperature of the point of the closure section low, and can prevent the open circuit by oxidation of the weld zone of a wiring member etc.

[0016] Moreover, the point of the closure section which is lamp equipment according to claim 1 and by which the fault temperature up control means has been arranged at the transparence member side comes to project invention according to claim 8 on the outside of a transparence member. Thereby, since the point of the closure section is cooled by the open air, too, the temperature of the point of the closure section can be suppressed low and the open circuit by oxidation of the weld zone of a wiring member etc. can be prevented.

[0017] Moreover, invention according to claim 9 is claim 6 thru/or lamp equipment according to claim 8, and is further equipped with heat dissipation or the cooling means which carries out endoergic for the heat conducted to the way side outside lamp equipment. As a cooling means, a cooling fan, a radiation fin, a Peltier device cooling module, etc. can be used, for example. Since heat can be efficiently radiated in the heat which this conducted to the heat conducted with the conductive-heat means, the front face of a transparence sealing member, or the periphery, or the projected heat of the point of the closure section, the temperature of the point of the closure section can be suppressed low easily.

[0018] Moreover, invention according to claim 10 is equipped with the arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, and the closure section of the pair which extends from an arc tube, and the closure section of a pair is a high-pressure-steam discharge lamp which has mutually different die length. using such a high-pressure-steam discharge lamp -- for example, the lamp equipment which can prevent an open circuit according to claim 4 suppress the temperature of the point of the closure section low like, and according to oxidation of the weld zone of a wiring member etc. can be constituted.

[0019]

[Embodiment of the Invention] Hereafter, the example of lamp equipment using the high-pressure mercury vapour discharge lamp as a gestalt of desirable operation of this invention is explained to a detail using a drawing.

[0020] Gestalt 1>> of <<operation The lamp equipment using the high-pressure mercury vapour discharge lamp with which the die length of the closure section was formed asymmetrically, and the above-mentioned discharge lamp is explained. As shown in drawing 1 , lamp equipment 10 has ellipsoid-like reflector 11a,

and has the reflecting mirror 11 whose diameter of opening is 80mm. The discharge lamp 21 whose lamp power (rated power) is 200W is arranged on the interior of a reflecting mirror 11. Even when opening of a reflecting mirror 11 is sealed by the front windshield 12 and a discharge lamp 21 is damaged, a loud explosive sound, scattering of the piece of glass, emission of mercury vapour, etc. are prevented certainly.
[0021] A discharge lamp 21 has the closure sections 23 and 24 of the pair connected with the both ends of an arc tube 22, respectively. Die length differs mutually and the closure section 23 by the side of a front windshield 12 of the closure sections 23 and 24 is longer than the closure section 24 of another side. Moreover, it is set up so that the tip of the closure section 23 may be located near the front windshield 12. While one pair of discharge electrodes 25 of the shape of the coiled form which consists of a tungsten, or a rod are formed, photogene (not shown), such as mercury 26 and rare gas, is enclosed with the interior of an arc tube 22. In addition, as a discharge lamp 21, not only the above high-pressure mercury vapour discharge lamps but that with which halogen gas, a halogenation metal, etc. were further enclosed as enclosure matter and mercury may not be included.
[0022] The closure sections 23 and 24 have the metallic foils 27 and 28 which consist of refractory metals, such as molybdenum electrically connected to the electrode 25, respectively, and the glass tube extended from the arc tube 22, and the airtightness of the discharge space of an arc tube 22 is held by the foil closure of metallic foils 27 and 28 and a glass tube. The discharge electrode 25 of a pair is welded to the end section of the metallic foils 27 and 28 by which the closure was carried out to the interior of the closure sections 23 and 24 and which consist of molybdenum, for example, respectively. The other end of metallic foils 27 and 28 is welded to the metal rods 29 and 30 with which an edge consists of molybdenum exposed to the exterior of the closure sections 23 and 24 by weld zones 29a and 30a, as shown in drawing 2 . The metal rod 29 is welded to lead wire 31 by weld zone 31a. On the other hand, the metal rod 30 is welded to the mouthpiece 32 which covers the edge of the closure section 24. A discharge electrode 25 and the metal rods 29 and 30 are connected through the metallic foils 27 and 28 by which the closure was carried out into the closure section 23 and 24 as mentioned above, because whenever [sealing / of the arc tube 22 interior] is raised and a high-pressure condition is maintained. That is, the metal rods 29 and 30 are not necessarily easy to raise adhesion with the closure sections 23 and 24 from the difference of coefficient of thermal expansion with glass etc. On the other hand, metallic foils 27 and 28 are very thin, and its touch area with the closure sections 23 and 24 is large, and since they can raise adhesion easily, they can keep the interior of an arc tube 22 easy to high pressure.
[0023] A discharge lamp 21 is arranged so that the gap between the discharge electrodes 25 of a pair (arc light-emitting part) may be located in the 1st focus in the ellipsoid of a reflecting mirror 11, it is the part of a mouthpiece 32 and seal immobilization is carried out through cement 33 at lamp fixed hole 11b formed in the pars basilaris ossis occipitalis of a reflecting mirror 11. Moreover, the lead wire 31 of a discharge lamp 21 is taken out by the exterior of a reflecting mirror 11 through lead-wire hole 11c formed in the wall surface of a reflecting mirror 11. The above-mentioned lead-wire hole 11c is also sealed with cement 34.
[0024] Since the distance of weld zone 29a of a metallic foil 27 and the metal rod 29 and the light-emitting part of a discharge lamp 21 becomes long by forming the closure section 23 by the side of a front windshield 12 as mentioned above for a long time than the closure section 24 by the side of a mouthpiece 32, the temperature rise of the above-mentioned weld zone 29a can be suppressed. When temperature was actually measured and the discharge lamp 21 each whose die length of the closure sections 23 and 24 is 25mm is made to turn on with the lamp power of 200W, If the maximum temperature (tube wall inside side of the arc tube upper part) of an arc tube 22 amounts to about 1,000 degrees C In the case of the discharge lamp 21 which the temperature of weld zone 29a set the die length of the closure section 23 to 35mm to having gone up to 507 degrees C, and set the die length of the closure section 24 to 25mm, the temperature of weld zone 29a was a maximum of 388 degrees C. Although this temperature is higher than the temperature (350 degrees C) indicated by IEC60357 which is the convention about a halogen lamp, in order to prevent the metallic foil 27 metallurgy group rods 29, these oxidation corrosion of weld zone 29a, etc., it is temperature low enough. So, even if the adhesion of the metal rod 29 and the closure section 23 falls and above-mentioned weld zone 29a etc. touches the air in lamp equipment 10, the open circuit by oxidation corrosion etc. can be prevented. Similarly, the temperature rise in welding part 31a of the metal rod 29 and lead wire 31 can also be controlled, and the open circuit in welding part 31a can also be prevented. Therefore, when it replaced not only with lamp equipment but with the metallic foil 27 and the metal rod 29 using the discharge lamp of the foil closure structure show in drawing 1 and the single rod-like wiring member be used, or when it make the closure section 23 penetrate an electrode 25 directly, respectively, without use a metallic foil 27 and the edge be expose outside, the open circuit in the welding part of these and lead wire 31 can be prevent.

[0025] Here, since the light reflected with the reflecting mirror 11 condenses to the 2nd focus when forming a light-emitting part near the 1st focus as mentioned above, using an ellipsoid mirror as a reflecting mirror 11, it is thought that the heating operation by the reflected light becomes large, so that the point of the closure section 23 approaches the 2nd focus. However, since the temperature fall operation by the point of the closure section 23 keeping away from a light-emitting part is usually larger, the temperature of the point of the closure section 23 can be suppressed low as mentioned above. In addition, covering the overall length of the closure section 23, a reflecting layer is formed in the periphery of the closure section 23 in the point of the closure section 23, near weld zone 29a, etc., the heating operation by the above-mentioned reflected light is reduced, and you may enable it to suppress the temperature of the point of the closure section 23 low more. Moreover, when the temperature of the point of the closure section 23 can be low suppressed only by reducing the heating operation by the reflected light when the lamp power of a discharge lamp 21 is small, it is not necessary to necessarily make the closure section 23 longer than the closure section 24.

[0026] Gestalt 2>> of <<operation The example of lamp equipment equipped with a means to radiate heat to the exterior of a reflecting mirror in the heat near the closure section of a discharge lamp is explained. In addition, in the gestalt of the following operations, the number same about the component which has the same function as the lamp equipment of the gestalt 1 grade of operation is attached, and explanation is omitted. As shown in this lamp equipment 10 at drawing 3 - drawing 5 , the heat radiator 41 which radiates heat to the exterior of a reflecting mirror 11 in the heat of closure section 23 near [a discharge lamp 21] is formed. This heat radiator 41 consists, high ingredient, for example, copper plate, of thermal conductivity, and consists of heat sink 41a mostly twisted around the closure section 23 covering the overall length, conductive-heat section 41b which leads the heat of heat sink 41a to the exterior of a reflecting mirror 11, and radiator 41c which radiates heat in the drawn heat.

[0027] Although effectiveness predetermined also in heat sink 41a constituted by only twisting a copper plate etc. around the periphery of the closure section 23 is acquired, in order to acquire bigger effectiveness, heat sink 41a and the closure section 23 are stuck. For example, it is made to heat and stick, after making the glass powder of a low-melt point point intervene and twisting a copper plate rather than the closure section 23. Moreover, although heat sink 41a has so high that a faying surface product (adhesion die length) with the closure section 23 is large the endoergic effectiveness, what was partially twisted in the range which can control the temperature rise not only the thing of the closure section 23 mostly twisted covering an overall length but near weld zone 29a is sufficient as it.

[0028] Conductive-heat section 41b is prepared so that the part which becomes the projected area of the direction of an optical axis, i.e., the shadow of incident light, may become small, and a copper plate surface may become perpendicular to a front windshield 12. Moreover, the part from which conductive-heat section 41b in a reflecting mirror 11 is drawn outside is sealed with cement 42, as shown in drawing 3 . Although the width of face of conductive-heat section 41b shows the example set up in drawing 3 more narrowly than the width of face of heat sink 41a, it may carry out making it the same width of face as heat sink 41a etc. The cooling systems 43, such as a radiation fin, are formed in radiator 41c. In addition, as a cooling system 43, it can replace with a radiation fin and a cooling fan, the cooling module using a Peltier device, a water-cooled cooling system, etc. can also be used. A thermally conductive high case may be used as a cooling system 43. Moreover, these may be combined as a cooling system 43. Moreover, the gas of the space section surrounded by the reflecting mirror 11 and the front windshield 12 is circulated between the radiators arranged outside, and you may make it cool the inside of lamp equipment.

[0029] By the above-mentioned configuration, the heat which got across to the closure section 23 by heat conduction etc. is conducted from the light-emitting part of a discharge lamp 21 to radiator 41c of the outside of a reflecting mirror 11 through heat sink 41a to conductive-heat section 41b, and heat is radiated. So, the temperature of the closure section 23 can be kept low and the open circuit by the oxidation corrosion of weld zone 29a of the metal rod 29 and a metallic foil 27 etc. can be prevented. Moreover, when heat sink 41a is prepared near the point of the closure section 23 at least, the prevention effectiveness of the open circuit by the oxidation corrosion of weld zone 31a of the metal rod 29 and lead wire 31 etc. can be heightened further.

[0030] In addition, if the ingredient of a heat radiator 41 is not only a copper plate but an ingredient with comparatively large thermal conductivity as mentioned above, it can acquire the same cooling effect. Moreover, you may make it use the capillary which makes conductive-heat section 41b etc. circulate through a heat pipe or a refrigerant compulsorily. In this case, it can perform easily stopping the incident light interrupted by these few by mating the above-mentioned heat pipe and a capillary with lead wire 31,

making it pull out to the exterior of a reflecting mirror 11, and making a heat pipe, a capillary, and lead wire 31 into coaxial structure especially. Moreover, conductive-heat section 41b is prepared in two or more places, as shown not only in what is prepared only in one place but in drawing 6 , and you may make it heat release become large more. Moreover, when you may make it the direction of the closure section 23 become long like the gestalt 1 of not only this but operation and the heat dissipation effectiveness by the heat radiator 41 is acquired enough, you may make it the direction of the closure section 23 become short in the example of drawing 3 , although the example to which the die length of the closure section 23 and closure section 24 ** was set equally is shown.

[0031] Gestalt 3>> of <<operation A discharge lamp is formed in one with a front windshield, and the example of the lamp equipment constituted so that the tip of the closure section might touch on the open air is explained. As shown in drawing 7 , the edge of the closure section 23 was formed in one with the front windshield 12, and the discharge lamp 21 has exposed weld zone 31a of the point of the metal rod 29, and lead wire 31 to the external surface side of a front windshield 12. Moreover, near the front windshield 12, the cooling fan 51 which sprays the open air on the external surface of 12 is formed. Since the heat of the point of the closure section 23 radiates heat from the external surface of a front windshield 12 etc. by being constituted as mentioned above, the temperature near weld zone 29a of a metallic foil 27 and the metal rod 29 is suppressed low, and the open circuit by oxidation corrosion, such as weld zone 29a, etc. is prevented.

[0032] In addition, it replaces with the above-mentioned cooling fan 51, and a radiation fin, the cooling module using a Peltier device, etc. may be prepared near the periphery section of a front windshield 12 so that incident light may not be interrupted, and you may carry out combining these etc. Furthermore, when the temperature near weld zone 29a is suppressed low enough by the free convection near the external surface of a front windshield 12 etc., it is not necessary to form a cooling fan 51 etc. Moreover, when the overall length (optical-axis lay length) of lamp equipment 10 may be long, you may make it make it project further but in the example of drawing 7 , as shown in drawing 8 as the tip of the closure section 23 is projected more slightly than the front face of a front windshield 12. Thus, if it is made for weld zone 29a to be mostly located in the method side of outside rather than the front face of a front windshield 12, it can perform easily suppressing the temperature near weld zone 29a low further.

[0033] Moreover, in the example of drawing 7 , although the die length of the closure section 23 shows the example set up like the gestalt 1 of operation for a long time than the closure section 24, it is not restricted to this. that is, since the temperature near weld zone 29a is low suppressed by the heat dissipation from the front face of a front windshield 12 even when the distance of the light-emitting part of a discharge lamp 21 and weld zone 29a is short, it is shown in drawing 9 -- as -- the die length as the closure section 24 with the same closure section 23 -- or it can also set up so that it may become short. So, it can also make it easy to constitute the lamp equipment 10 using the discharge lamp 21 of comparatively big size compared with the magnitude of a reflecting mirror 11. Moreover, you may make it form the heat radiator 41 in which the discharge lamp and the front windshield were shown with the gestalt 3 of operation as mentioned above in addition to the configuration formed in one.

[0034] Gestalt 4>> of <<operation Like the gestalt 3 of operation, a discharge lamp is formed in one with a front windshield, and other examples of the lamp equipment constituted so that the tip of the closure section might touch on the open air are explained. As shown in drawing 10 , hole 12a is formed in a center section, and it is prepared in the front windshield 12 so that the edge of the closure section 23 may penetrate. The clearance between the closure section 23 and hole 12a is pasted up and sealed with the bulking agent 52 of an ingredient which is different in a front windshield 12 and the closure section 23. As for a bulking agent, it is desirable that they are translucency ingredients, such as more concrete for example, a front windshield 12, glass with the melting point lower than the closure section 23, etc.

[0035] Thus, after forming a front windshield 12 and the closure section 23 separately, compared with the lamp equipment of the gestalt 3 of operation using the arc tube 21 united with the front windshield 12, a production process becomes easier by joining both. Also when constituted as mentioned above, since the heat of the point of the closure section 23 radiates heat from the external surface of a front windshield 12 etc. like the gestalt 3 of operation, too, the temperature near weld zone 29a of a metallic foil 27 and the metal rod 29 is suppressed low, and the open circuit by oxidation corrosion, such as weld zone 29a, etc. is prevented. In addition, also in the gestalt of this operation, the same various deformation is as applicable as the gestalt 3 of operation explained.

[0036] In addition, in the gestalt of each above-mentioned implementation, although the example using the ellipsoid mirror as a reflecting mirror was shown, concave mirrors, such as not only this but a parabolic mirror, may be used. In addition, although working pressure explained each with the gestalt of the above-

mentioned implementation about the example which used the discharge lamp of about 200 atmospheric pressures, this invention is applicable also to the lamp equipment using the discharge lamp which operates less than with low voltage, for example, 100 atmospheric pressures, more. Moreover, this invention can be adapted for the lamp equipment using all the discharge lamps with which the welding part of a wiring member where we are anxious about heat deterioration with an elevated temperature not only near the lamp equipment using the discharge lamp of foil closure structure explained with the gestalt of operation but the discharge lamp was allotted. Moreover, although especially the gas in lamp equipment is not indicated, air may be enclosed and inert gas, such as argon gas, may be enclosed. Moreover, in addition to each above-mentioned configuration, it replaces with each above-mentioned configuration, the gas in lamp equipment is circulated between external radiators, and you may make it cool the inside of lamp equipment.

[0037]

[Effect of the Invention] Since according to this invention the temperature of the point of the closure section can be suppressed low and the open circuit by oxidation of the weld zone of a wiring member etc. can be prevented, reinforcement of a lamp and decline in a percent defective can be aimed at. It can also make it easy to increase lamp power furthermore or to miniaturize a reflecting mirror. Moreover, according to this invention, since the extremes-of-temperature rise inside equipment can be controlled even if it seals lamp equipment, the explosive sound of an arc tube can be controlled and scattering of the piece of glass and emission of mercury vapour can be prevented further certainly.

[Translation done.]

* NOTICES *

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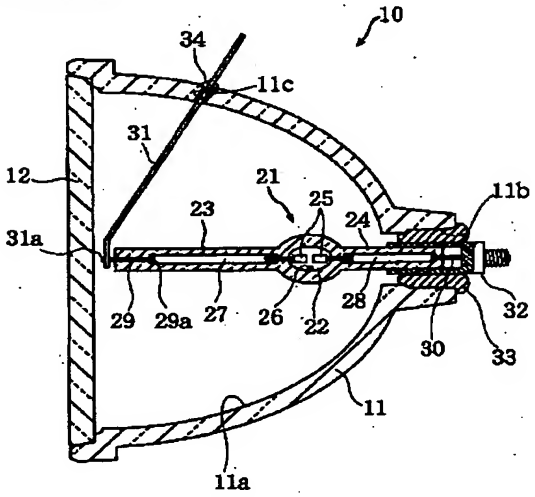
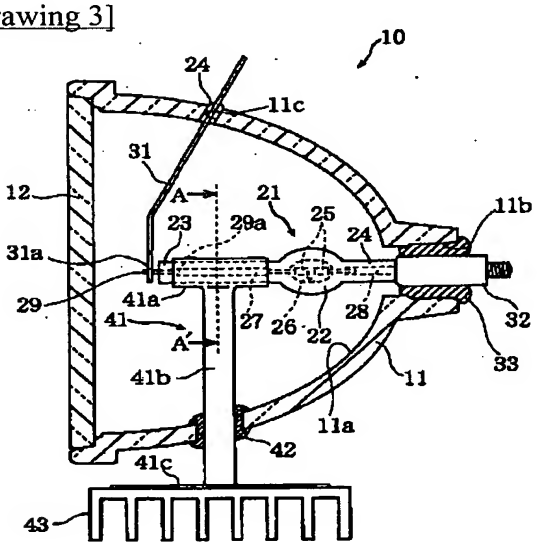
DRAWINGS

[Drawing 1]

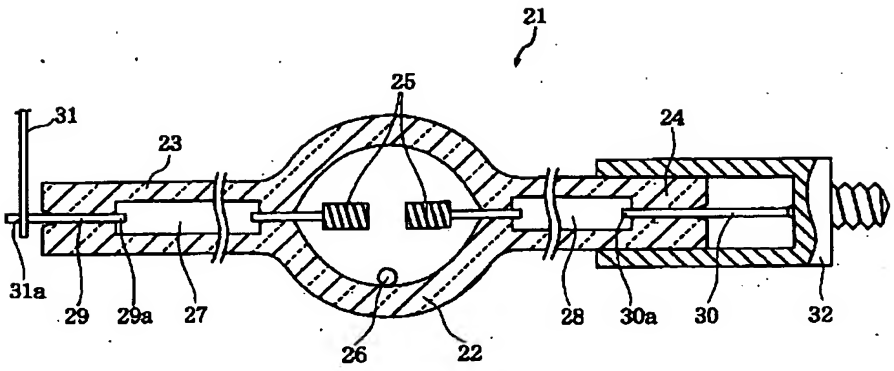


10 ランプ装置	25 放電電極
11 反射鏡	27、28 金属箔
12 前面ガラス	29、30 金属ロッド
22 発光管	29a、30a、31a 溶接部
23、24 封止部	31 リード線

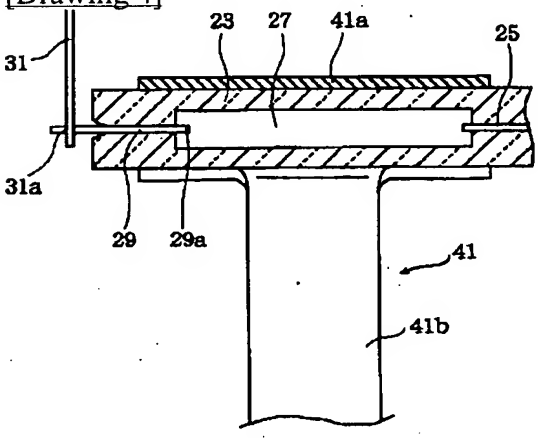
[Drawing 3]



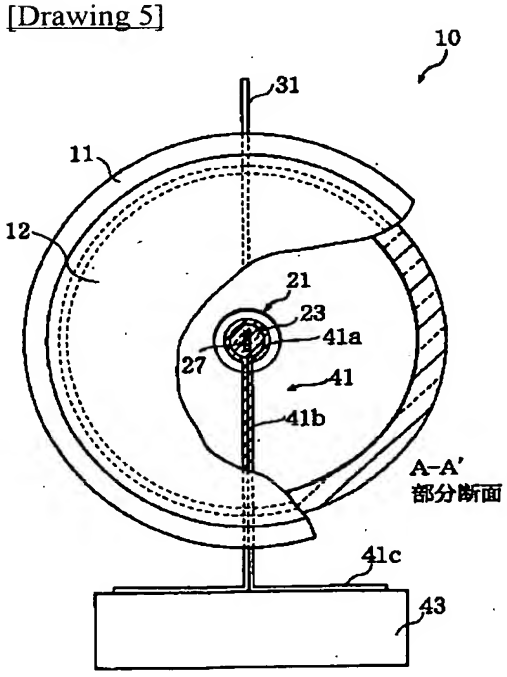
[Drawing 2]



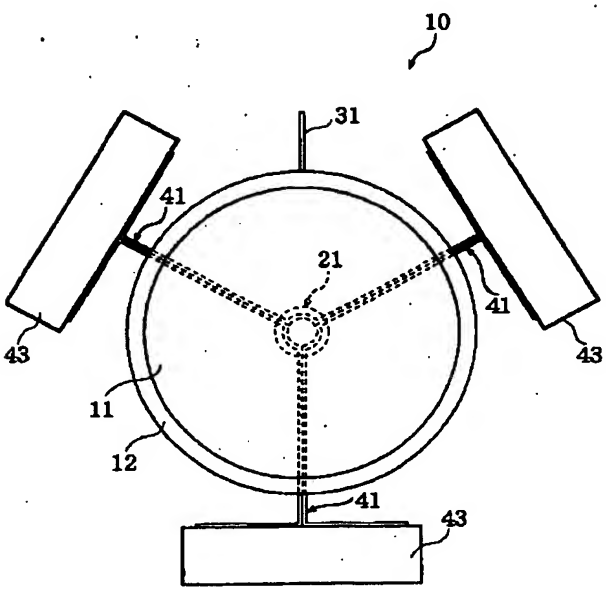
[Drawing 4]



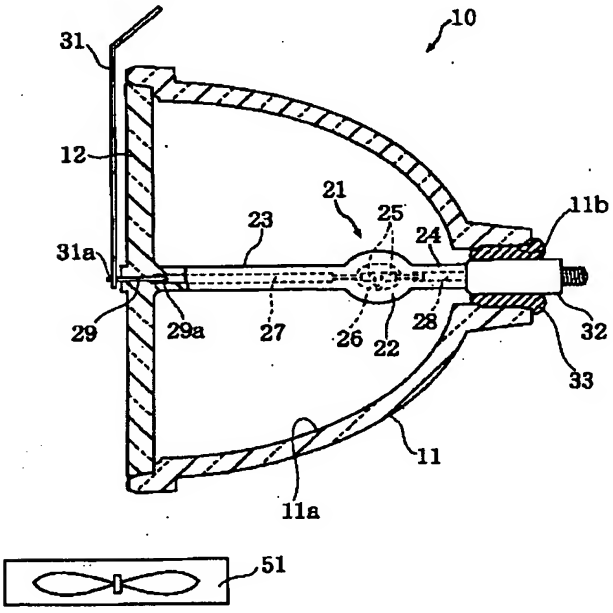
[Drawing 5]



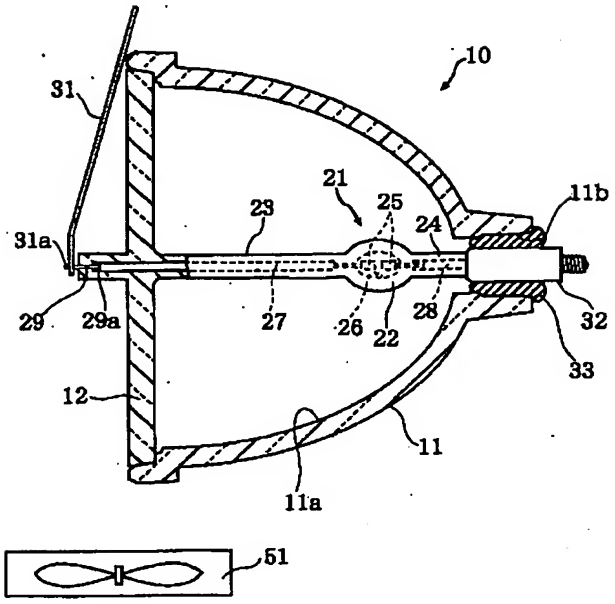
[Drawing 6]



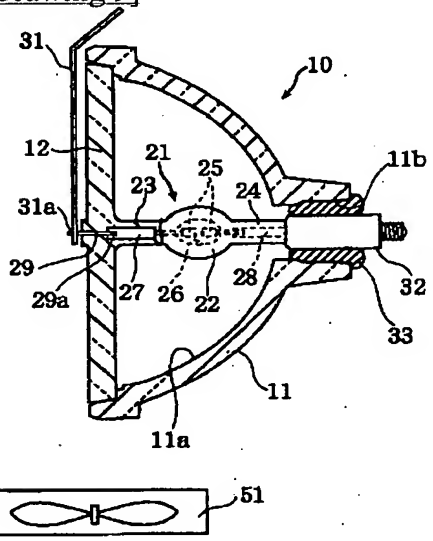
[Drawing 7]



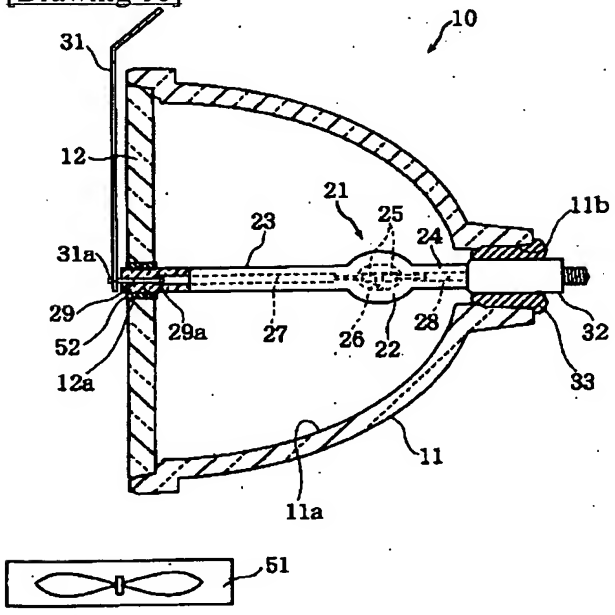
[Drawing 8]



[Drawing 9]



[Drawing 10]



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CORRECTION OR AMENDMENT

[Kind of official gazette] Printing of amendment by the convention of 2 of Article 17 of Patent Law
[Section partition] The 1st partition of the 7th section
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[Date of Publication] August 17, Heisei 13 (2001. 8.17)
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[Application number] Application for patent 2000-364656 (P2000-364656)
[The 7th edition of International Patent Classification]

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F21V 29/00
H01J 61/36

[FI]

H01J 61/52 B
F21V 29/00 A
H01J 61/36 B

[Procedure revision]
[Filing Date] March 25, Heisei 14 (2002. 3.25)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Modification
[Proposed Amendment]
[Claim(s)]
[Claim 1] The discharge lamp equipped with the closure section of the pair which extends from the arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, and said arc tube,
The reflecting mirror which reflects the light which said discharge lamp emitted,
The transparence member which covers opening of said reflecting mirror and holds said discharge lamp in the space between said reflecting mirrors,
It is lamp equipment possessing a fault temperature up control means to control the temperature rise of the welding part of the wiring member electrically connected to the electrode of said discharge lamp,
Said fault overtemperature protection means is lamp equipment which is a conductive-heat means to conduct the heat of said closure section arranged at said transparence member side on the outside of lamp equipment.
[Claim 2] The discharge lamp equipped with the closure section of the pair which extends from the arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, and said arc tube,
The reflecting mirror which reflects the light which said discharge lamp emitted,
The transparence member which covers opening of said reflecting mirror and holds said discharge lamp in the space between said reflecting mirrors,

It is lamp equipment possessing a fault temperature up control means to control the temperature rise of the welding part of the wiring member electrically connected to the electrode of said discharge lamp,
Said fault temperature up control means is lamp equipment with which it comes to unite with said transparence member said closure section arranged at said transparence member side.
[Claim 3] Lamp equipment according to claim 1 to 2 which possesses further a cooling means to remove the heat conducted on the outside of lamp equipment.
[Procedure amendment 2]
[Document to be Amended] Specification
[Item(s) to be Amended] 0007
[Method of Amendment] Modification
[Proposed Amendment]
[0007]
[Means for Solving the Problem] This invention for solving the above-mentioned trouble is lamp equipment characterized by providing the following. The discharge lamp equipped with the closure section of the pair (that is, it connects with the arc tube) which extends from the arc tube and arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed The reflecting mirror which reflects the light which the discharge lamp emitted The transparence member which covers opening of a reflecting mirror and holds a discharge lamp in the space between reflecting mirrors A fault temperature up control means to control the temperature rise of the welding part of the wiring member electrically connected to the electrode of a discharge lamp
[Procedure amendment 3]
[Document to be Amended] Specification
[Item(s) to be Amended] 0009
[Method of Amendment] Modification
[Proposed Amendment]
[0009] As for this invention, it is desirable that a discharge lamp has foil closure structure. This invention is useful to the discharge lamp of the so-called foil closure structure used widely. In the discharge lamp of foil closure structure, the metallic foil which can secure the big touch area as a wiring member in the closure section is used so that it may not be concerned with the difference in the damage of a thermal shock, or both coefficient of thermal expansion between the glass which constitutes the closure section, but adhesion may be maintained and whenever [sealing / of the space section on which the electrode etc. was arranged] may be maintained. The end of a metallic foil is connected in the edge of the closure section by the conductive member and welding which were connected to the external power. By establishing a fault temperature up control means, an extremes-of-temperature rise can be controlled in the welding part of the metallic foil in the closure section which becomes this elevated temperature, and a wiring member. Moreover, also in the welding part of the wiring member located in the near, a temperature rise can be controlled by the closure outside.
[Procedure amendment 4]
[Document to be Amended] Specification
[Item(s) to be Amended] 0011
[Method of Amendment] Modification
[Proposed Amendment]
[0011] As for this invention, it is desirable that the interior of the reflecting mirror which holds a discharge lamp, and a transparence member is sealed airtightly. Thereby, when an arc tube is damaged, an explosive sound can be reduced sharply and scattering of the piece of glass and the dispelling emission of mercury vapour can be prevented certainly.
[Procedure amendment 5]
[Document to be Amended] Specification
[Item(s) to be Amended] 0012
[Method of Amendment] Modification
[Proposed Amendment]
[0012] This invention has the die length from which the closure section of a pair differs mutually, and it is [a fault temperature up control means] desirable to come to arrange the closure section of the longer one the closure section of the shorter one to a transparence member side at the pars-basilaris-ossis-occipitalis side of a reflecting mirror. It is desirable to be set up so that the edge of the closure section arranged at a transparence member side may more specifically be located near the transparence member.

[Procedure amendment 6]
[Document to be Amended] Specification
[Item(s) to be Amended] 0014
[Method of Amendment] Modification
[Proposed Amendment]
[0014] As for this invention, it is desirable that it is a conductive-heat means by which a fault temperature up control means conducts the heat of the closure section arranged at the transparence member side on the outside of lamp equipment. As a conductive-heat means, an end can be twisted around the closure section, for example, and a copper plate, a heat pipe, etc. which extended the other end even to the exterior of lamp equipment can be used. Since the heat of the closure section radiates heat to the exterior of lamp equipment through such a conductive-heat means, too, the temperature of the point of the closure section can be suppressed low and the open circuit by oxidation of the weld zone of a wiring member etc. can be prevented.
[Procedure amendment 7]
[Document to be Amended] Specification
[Item(s) to be Amended] 0015
[Method of Amendment] Modification
[Proposed Amendment]
[0015] As for this invention, it is desirable to come to unite with a transparence member the closure section by which the fault temperature up control means has been arranged at the transparence member side. Thereby, since the heat of the point of the closure section radiates heat from the external surface of a transparence sealing member etc., too, it can suppress the temperature of the point of the closure section low, and can prevent the open circuit by oxidation of the weld zone of a wiring member etc.
[Procedure amendment 8]
[Document to be Amended] Specification
[Item(s) to be Amended] 0016
[Method of Amendment] Modification
[Proposed Amendment]
[0016] As for this invention, it is desirable that the point of the closure section by which the fault temperature up control means has been arranged at the transparence member side comes to project on the outside of a transparence member. Thereby, since the point of the closure section is cooled by the open air, too, the temperature of the point of the closure section can be suppressed low and the open circuit by oxidation of the weld zone of a wiring member etc. can be prevented.
[Procedure amendment 9]
[Document to be Amended] Specification
[Item(s) to be Amended] 0017
[Method of Amendment] Modification
[Proposed Amendment]
[0017] As for this invention, it is desirable to have further heat dissipation or the cooling means which carries out endoergic for the heat conducted to the way side outside lamp equipment. As a cooling means, a cooling fan, a radiation fin, a Peltier device cooling module, etc. can be used, for example. Since heat can be efficiently radiated in the heat which this conducted to the heat conducted with the conductive-heat means, the front face of a transparence sealing member, or the periphery, or the projected heat of the point of the closure section, the temperature of the point of the closure section can be suppressed low easily.
[Procedure amendment 10]
[Document to be Amended] Specification
[Item(s) to be Amended] 0018
[Method of Amendment] Modification
[Proposed Amendment]
[0018] This invention is equipped with the arc tube with which the electrode of a pair countered and has been arranged in tubing with which photogene is enclosed, and the closure section of the pair which extends from an arc tube, and the closure section of a pair is a high-pressure-steam discharge lamp which has mutually different die length. By using such a high-pressure-steam discharge lamp, the lamp equipment which suppresses the temperature of the point of the closure section low and can prevent the open circuit by oxidation of the weld zone of a wiring member etc. can be constituted.

[Translation done.]